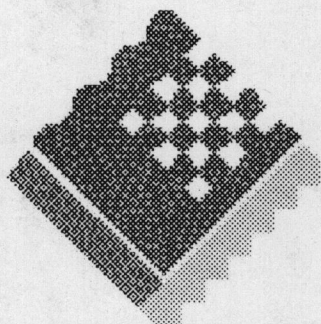


# Service Manual



**EIZO**

**NANAO**

200-5927-~

ASSY CLR DSPL 29TYPE 31K 2934  
NANAO (FST)

(Nanao JPN ~ MS-2934)

## Fuse locations



**WARNING!**

- Never touch places other than those specified. Touching places other than those specified can cause electric shock and short circuit. Disconnect the machine from the supply before attempting the replacement of any fuse.



**IMPORTANT!**

- FUSES should only be replaced by QUALIFIED SERVICE PERSONNEL.

There are fuses used on this machine to protect the user and the machine from damage. Only replace the fuse once you have remove the cause of its failure. Detailed below is a list of the fuses used, their location and P.C.B. reference:

PART NUMBER	LOCATION	TYPE & DETAILS	QTY
200-5927~~ (08N32018A9)	F901	6.3A 250V 20mm T CERAMIC	1 PER MONITOR

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Contents subject to change without notice.





## About this manual

This primary service manual is prepared to define the basic repairs or services workflow (open the package ~ repair ~ adjustment ~ inspection ~ packing) of the defective products returned from the user for the smooth and certain repairs and services. Please read and understand this manual before attempting service and service based on the each service manual.

This manual and service manual is prepared to assist service organizations or engineers who are in charge of servicing EIZO products, is not for end users but for those technically oriented service engineers from distributors, dealers, VARs and other wholesalers or retailers who are capable of servicing the unit.

### **DANGER**

It indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.

### **WARNING**

It indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

### **CAUTION**

It indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury and/or property-damage.



It indicates a prohibited action.



It indicates a general caution.



# **I. Before the service**

## **I-1. General Notice**

### **DANGER**

**The EIZO products contain high voltage circuit. Only experienced service personnel should perform repairs or service work on high voltage monitors.**

**When the cabinet of the product is removed and the product is operating, there is a risk of an electric shock hazard.**

### **WARNING**

1) **Unplug the power cord before servicing.**

Operation of the monitor or peripheral with the cabinet removed involves a shock hazard or may result in a damage of the circuit. Ensure the power cord is disconnected before removing the cabinet and replacing any parts in the unit.

2) **Connect the earth lead of the power cord with the ground.**

Securely connect the earth lead of the power cord of the products and the measuring equipment. There is a risk of the electric shock hazard or damage.



3) **Do not wear any metal or accessories.**

There is a risk of an electric shock.



**Perform the inspection of the measuring equipment before service work.**

Before starting daily service work, perform the inspection of the measuring equipment and record its results.

## I-2. Handling of electric parts

### **⚠ WARNING**

#### **Replace only with the exact factory recommended spare parts.**

The use of unauthorized substitute parts may cause an electric shock, damage to the monitor, or may exceed the specified X-ray radiation. Please refer to the below notice\* regarding the handling and keeping method of the electric parts.

- Safety related parts    Parts List :    "S"    Circuit Diagram : "△"
- X-ray related parts    Parts List :    "X"    Circuit Diagram : "★"
- Anti-static related parts                      Parts List :    "A"
- Moisture protection related parts           Parts List :    "M"

\*Notice at handling and keeping the electric parts

#### 1. Anti-static related parts

In order not to damage or lower the performance of the transistor or IC by the electrostatic from the body, wear the wrist strap when you handle the anti-static semiconductor.

The usage of the wrist strap

- (1) wear the wrist strap tightly at the wrist.(right or left)
- (2) Connect the earth and alligator clip.



connect to the earth



#### 2. Moisture protection related parts

##### 1) unopened

Handle with care in order not to damage or pick with the sharp edged tool. The SMD stocker (moisture-proof depository) is recommended for the keeping. The normal temperature (below 30 °C ) and humidity (below 70 %) is also acceptable if it is packed with moisture-proof method. The keeping term is max one year. When using the moisture protection parts, confirm the silica-gel enclosed with the parts shows blue. If it is absorbed, it shows pink or clear.

##### 2) opened

Once it is opened, keeping in the SMD stocker is recommendable. The keeping term in the stocker is maximum 6 months. If the SMD stocker is not available, the parts must be used within 4 days under the normal temperature (below 30 °C ) and humidity (below 70 %).

##### 3) F.B.T and keeping term instructed parts from the maker

They must be kept as the following condition in order not to lower the performance of the parts due to the long-term stock. The parts which expire the keeping limit must be disposed.

Parts	Packing	Keeping terms (after the production)
F.B.T (or the PCB Unit which equips the F.B.T)	Normal	15 months
	(Moisture protection packing moisture-proof aluminum bag with enclosing silica-gel)	8 years
Keeping term instructed parts	Normal /Special	Due to maker's instruction* *Instructed by updating this manual.



### I-3. Handling of the CRT

#### **⚠ WARNING**

- 1) **Replace with a CRT of the same type number for continued safety.**

The CRT used in the monitor employs integral implosion protection. If the CRT is replaced with a different type, it will result in an improper circuit function, exceed the specified Safety Standards range, or affect the picture quality guaranteed in the specifications.

- 2) **Take care not to scratch the coating of the Degauss Coil.**



Degauss Coil circuit is on the primary voltage line. It can result in a hazardous fire or electric shock. Follow the instructions below.\*

- \*1) The Degauss Coil has a current of 5~10A. When the coating of the Degauss Coil is damaged and the Coil directly touches the chassis or screws, the chassis voltage will become the same as the primary voltage line. This can result in hazardous danger as follows.

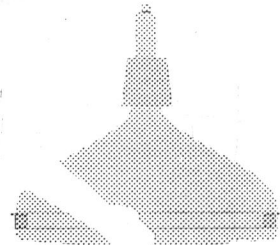
- (1) Electric Shock
  - (2) Short (Current Leakage)
  - (3) Degauss does not work
  - (4) Circuit Damage
  - (5) Damage of connected computers or peripherals
- 2) After the work is done, make certain that there are no damage on the coating of the Degauss Coil.
    - (1) The Degauss Coil is set in the specified place.
    - (2) The Degauss Coil does not touch the shields, screws, or other conductive sharp edges.
    - (3) The Degauss Coil is not pushed or pressed.
  - 3) To prevent these hazards, carry out the "Safety Test" on the beginning of this manual.
    - (1) Earth Continuity Test
    - (2) Withstanding Voltage Test

#### **⚠ CAUTION**



#### **Do not lift the CRT by the neck.**

The neck of the CRT is not firm enough to hold the entire CRT. Hold the CRT under your arms when lifting it. In case the CRT is dropped, it could result in injury.



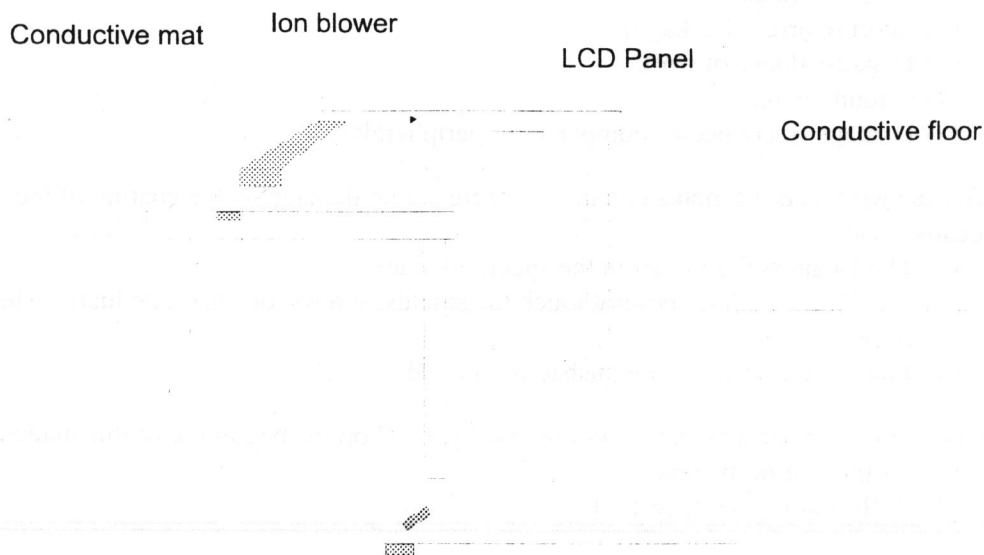
## I-4 Handling of the LCD panel

When servicing LCD, follow the instructions below for anti-static measures because LCD panel is weak for static electricity.

### 1. Places for Servicing

- 1) Conductive floor (Recommended resistance value:  $1 \times 10^5 - 1 \times 10^8 \Omega$ )  
\*We recommend you to clean and measure the floor twice a year and wax (conductive) once a year.
- 2) Conductive mat (Recommended resistance value:  $1 \times 10^6 - 1 \times 10^8 \Omega$ )
- 3) Anti-static parts box (Recommended resistance value:  $1 \times 10^5 - 1 \times 10^8 \Omega$ )
- 4) Ion blower  
\*Recommended method: AC  
\*Control the speed of the blower. This may cause an unbalance of ion.  
\*The ion blower may deteriorate due to dirt or moisture if it is used for long periods.  
Please clean it once a week.

Keep a space of 10~15 cm between the ion blower and the LCD Panel.



Securely connect to the GND.

## 2. Wear for Servicing

- 1) Wrist strap (Recommended resistance value:  $5 \times 10^5 - 1 \times 10^7 \Omega$ )

### **▲ WARNING**

**Use a wrist strap with  $5 \times 10^5 - 1 \times 10^7$  resistance for protection.**

When using a wrist strap without resistance, there is a risk of an electric shock.

- 2) Conductive shoes (Recommended resistance value:  $1 \times 10^5 - 1 \times 10^8 \Omega$ )  
\*  $1 \times 10^6$  or less is desirable.
- 3) Anti-static wear

## 3 Servicing Environment

Keep the room temperature at 18-24°C and the humidity between 50-80% RH.

## I-5 About Soldering works

### **▲ CAUTION**



- 2) **Do not press the FS jumper with soldering iron for long hours.**

This will cause melt of solder on the PCB parts side and connection with pattern may be incomplete. After soldering, check the solder part on the other side.

The soldering conditions are as follows: In order to keep the performance of the iron, perform the daily or periodical inspection of the iron. (check the point temperature of the iron is 340~375°C.)

Solder temperature		340~375°C
Solder Iron Watt	chip	Within 30W
	Discrete	30~60W
	Radiator	50~100W
Working time	Tip/discrete	Within 3 seconds
	Radiator	Within 6 seconds
Solder kind	Sn 60% or Sn 63% A class wire solder	
	Tip	Below $\phi 0.6\text{mm}$
	Discrete	Below $\phi 1.2\text{mm}$
Recommended Iron		HAKKO Corp. Mach 1 No.921
		HOZAN HS-25

## II. Service and Adjustment

### II-1. General Notice

#### DANGER

When adjusting or servicing the PCB with the power switch ON, securely connect the shield part of the ASSY CRT to the GND on the PCB (Secondary Radiator, etc.) with leads before turning the power switch on.

If not, the high voltage put into the monitor causes unstability of the external earth. This will result in a serious electric shock or damage.

#### WARNING



- 1) Do not connect or disconnect any wires or connectors while the products is in operation.

It may result in damage to the circuit or may cause an electric shock.



- 2) Do not short any portion of circuit while the product is in operation.

This will cause smoke, electric shock or damage to the transistors, ICs or other parts or circuit in the unit. (\*Excluding the Adjustments only when specified.)



- 3) Do not change the original design of the product.

This will cause smoke, electric shock or damage to the circuit.

- 4) Use 2 pin power plug of the Digital voltage meter.

Otherwise, an electric shock, damage to the circuit or breaker-down may occur

#### CAUTION



- Do not touch the sharp edge of the chassis.

It may result in injury.



## II-2. Notice about Electrical Circuit

### **⚠ WARNING**



- 1) **Do not touch the +B Voltage and High Voltage terminals inside the monitor.**

If carelessly contacted, it can cause serious shock or result in damage to the monitor.

- 2) **Check the adjustment VRs are adjusted within the specifications range and securely locked together with silicon rubber as instructed in the service manual.**

The VRs should be adjusted and then sealed with silicone rubber as instructed in the service manual. If the voltage is out of the specifications range, the X-ray radiation may increase or may cause damage to the monitor.



- 3) **Do not operate with a High Voltage level exceeding the specified range in the service manual.**

Failures in the High Voltage Adjustment can increase X-ray radiation or damage to the circuit. To check for the presence of High Voltage, use an accurate high impedance High Voltage Meter connected between the Anode Button and the secondary earth. It may cause a rise in the voltage when the Power Supply Voltage is out of the specifications range.

- 4) **Turn off the power switch and then connect the high voltage probe.**

Adjusting High Voltage with the monitor operating is extremely dangerous. An electric shock may occur.

- 5) **When checking wave on the primary voltage line, use the 2-pin power plug of oscilloscope. Do not connect GND on the primary circuit and GND on the secondary circuit (chassis).**

If not, this may cause electric shock, damage to the circuit or breaker-down.

- 6) **Do not check on the primary and secondary voltage line with same oscilloscope at the same time. If necessary, connect the Isolation Trans for the power of monitor.**

This may cause an electric shock or damage to the circuit.

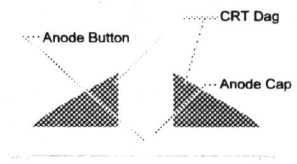
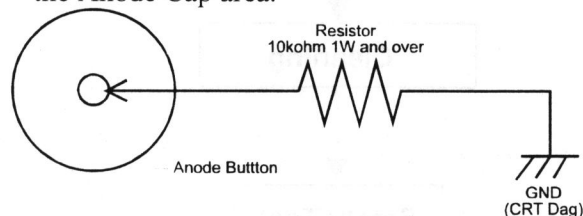


- 7) **Disconnect the Power Cord, and completely remove static charge before taking off the Anode Cap.**

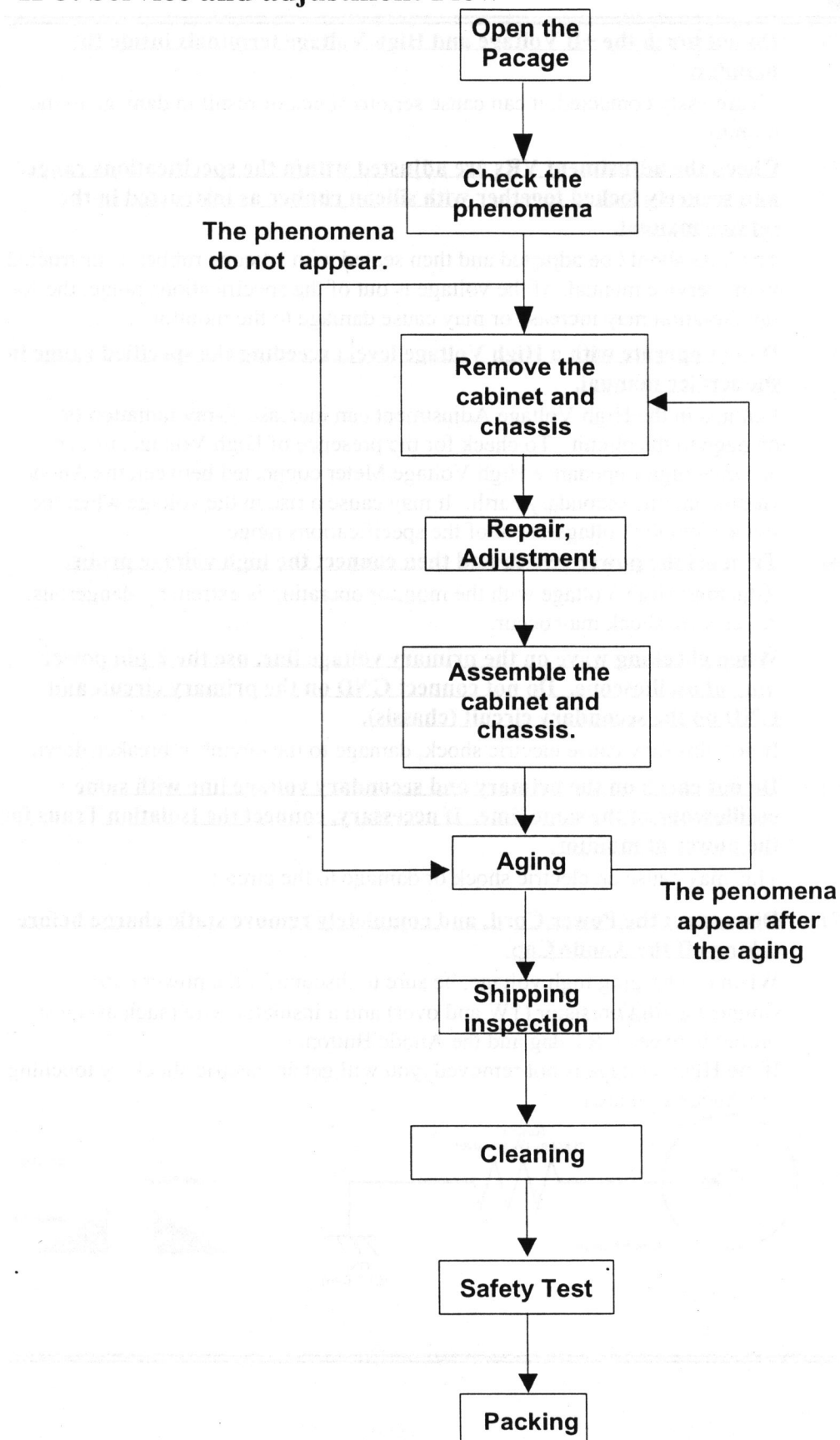
When discharging high voltage, be sure to disconnect the power cord.

Connect a 10kΩ resistor (1W and over) and a insulator wire (such as a test probe) between CRT dag and the Anode Button.

If the High Voltage is not removed, you will get an electric shock by touching the Anode Cap area.



### II-3. Service and adjustment Flow



### 1. Open the package

	Works	Controlled Item	Equipment
1.	Open the returned product from the user.	Packing Case	Crane
2.	Check the enclosed accessories in order not to miss at the shipment after the repair.	Enclosed accessories, RMA No. S/N	

### 2. Check the phenomena

	Works	Controlled Item	Equipment
1.	Check the phenomena of the returned products.	Phenomena, RMA No.	Signal Generator, Brightness meter, Scale, loupe
2.	When the phenomena do not appear, go to "4. Aging".		

### 3. Repair/Adjustment

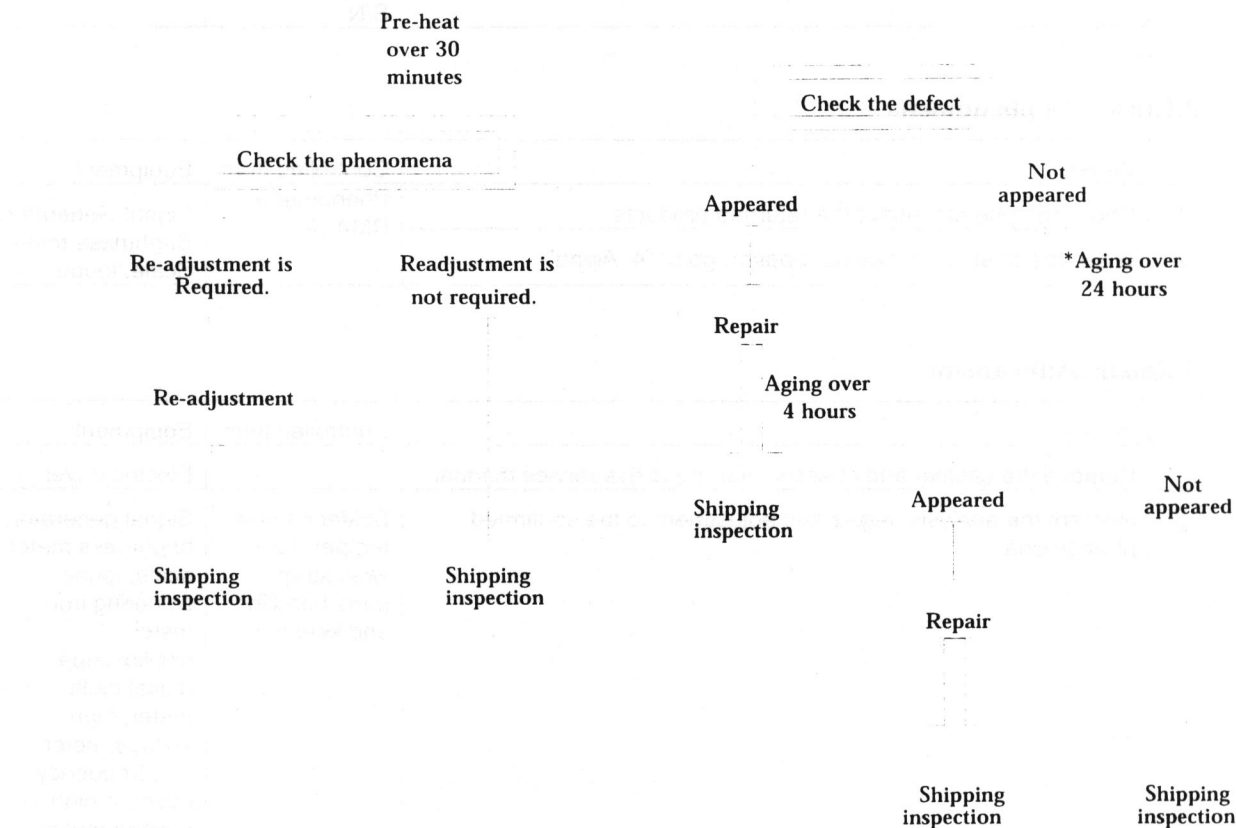
	Works	Controlled Item	Equipment
1.	Remove the cabinet and chassis referring to the service manual.		Electric driver
2.	Perform the analysis, repair and adjustment to the confirmed phenomena.	Soldering iron temperature, wrist strap, parts handling and keeping	Signal generator, brightness meter, scale, loupe, soldering iron, tester oscilloscope, digital multi meter, high voltage meter, PC, frequency counter, high voltage meter
3.	Assemble after the repair and adjustment works are finished. Regarding the screw tightening torque or tightening location, refer to the attached materials III-2.	Screw tightening torque	Electric driver torque driver

#### 4.Aging (flow)

- (1) Image quality claim
- (2) Another claim

(1)Image quality claim

(2) Defect product except (1).



	Notice at aging	Controlled Item	Equipment
1.	Input para-signal-generator, PC or signal generator during the aging.	Aging hours	Para-signal generator, PC, Signal Distributor
2.	The temperature is from 25C~45C. Regarding the products that can perform aging at the same condition with user (the internal shield or external cabinet are equipped.) the temperature control is not necessary.		
3.	The defective and damaged product due to the falling, etc. requires over 50 hours over aging.		
4.	Image quality adjustment, disconnecting, repair or the cabinet, etc. do not need aging. When the image quality adjustment, the pre-heat is needed before the phenomena confirmation for 30 minutes over.		
*	If the phenomena do not appear after 24 hours aging, contact with the user and decide the handling of it.		



## 5. Shipping Inspection

	Works	Controlled Item	Equipment															
1.	<p>Perform the following shipping inspection and confirm that the repaired product fulfills the specification. If it does not fulfill, repair or adjust again.</p> <table><tr><th></th><th>Inspection</th><th>Judgement standard</th></tr><tr><td>Image quality</td><td>Brightness/Focus/ Dostortion/Size, Purity/ Convergence/White Balance, Uniformity</td><td>Refer to the each service manual</td></tr><tr><td>Function Test</td><td>Check the Adjustment function of VR or SW,etc.</td><td>Operates correctly.</td></tr><tr><td>PCB/ Mechanical Test</td><td>Check the condition of soldering, parts, pattern, wiring, chassis.</td><td>There is no leg slip soldering, non-soldering, missing parts, pattern peeling or missing screws</td></tr><tr><td>Shock test</td><td>Shock parts, PCB or chassis and check the image quality and function.</td><td>The shock to the product does not affect to the image quality or function of the product.</td></tr></table>		Inspection	Judgement standard	Image quality	Brightness/Focus/ Dostortion/Size, Purity/ Convergence/White Balance, Uniformity	Refer to the each service manual	Function Test	Check the Adjustment function of VR or SW,etc.	Operates correctly.	PCB/ Mechanical Test	Check the condition of soldering, parts, pattern, wiring, chassis.	There is no leg slip soldering, non-soldering, missing parts, pattern peeling or missing screws	Shock test	Shock parts, PCB or chassis and check the image quality and function.	The shock to the product does not affect to the image quality or function of the product.	Proofread of the each meter, inspection before the work	PC, Signal Generator, Brightness meter, Scale Loupe
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## 6.Cleaning

	Works	Controlled Item	Equipment
1.	Clean the outer dirt of the returned products.	Scratch, dirt	Gauze, AR cloth, ethanol, isopropyl ethanol

## 7.Safety Test



**When any portion of the chassis is short-circuit caused by a leakage of primary voltage line, the conductive area may become high voltage which can result in an electric shock or other hazardous danger.**



- 1) **Testing equipment should be isolated by putting an insulating board in between.**

When the back cabinet of the monitor is removed and the monitor is operating, there is a risk of an electric shock.

- 2) **Keep people away during the test.**

When the back cabinet of the monitor is removed and the monitor is operating, there is a risk of an electric shock.



- 3) **Do not wear any metal or accessories.**

There is a risk of an electric shock when the circuit is shorted.

### 7-1 Earth continuity Test

(All model of the monitor, some peripherals which has the insulated transformer and earth function)

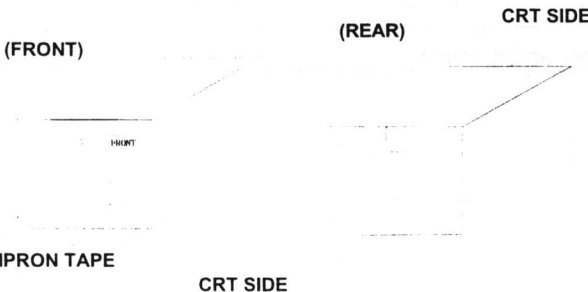
	Works	Controlled Item	Equipment
1.	Connect the Test AC cord to the product at the shipping stage.	Current, resistance	Test equipment for earth continuity Test
2.	Impress AC 25A between the conductive chassis and the earth terminal of the AC Power cord for 1.5~2.5 seconds. Press the test button of the equipment and check the OHM meter of the test equipment show below 0.1OHM.( the OHM meter which indicates the resistance does not enter in the red zone.		
3.	If it exceeds 0.1OHM, the product is distinguished as the rejected one. Reconfirm the earth lead connection of the product and test method.		
4.	After the test, check the image quality and function.		

## 7-2 Withstanding voltage check

(All model of the monitor, some peripherals which has the insulated transformer with AC power supply)

	Works	Controlled Item	Equipment													
1.	Connect the Test AC cord to the product at the shipping stage.	Voltage, Current	Test equipment for withstanding voltage check													
2.	Impress the AC voltage (100~120V: 1200VAC, 220~240VAC: 1500VAC) between a conductive chassis and the line of the AC cord for 1~2 seconds when the Main Power SW is ON. Press the test button of the equipment and confirm if it should not be NG.															
	<table><tr><th>Model</th><th>voltage</th><th>Current</th></tr><tr><td rowspan="2">CRT display, LCD display (except L23, L34)</td><td>1500VAC</td><td>25mA</td></tr><tr><td>1200VAC</td><td>20mA</td></tr><tr><td rowspan="2">LCD display L23, L34</td><td>1500VAC</td><td>5mA</td></tr><tr><td>1200VAC</td><td>5mA</td></tr></table>			Model	voltage	Current	CRT display, LCD display (except L23, L34)	1500VAC	25mA	1200VAC	20mA	LCD display L23, L34	1500VAC	5mA	1200VAC	5mA
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	1200VAC			20mA												
LCD display L23, L34	1500VAC	5mA														
	1200VAC	5mA														
3.	If it is broken down, the product should be distinguished as the rejected one. Reconfirm the internal condition of the product and test method.															
4.	After the test, check the image quality and function.															

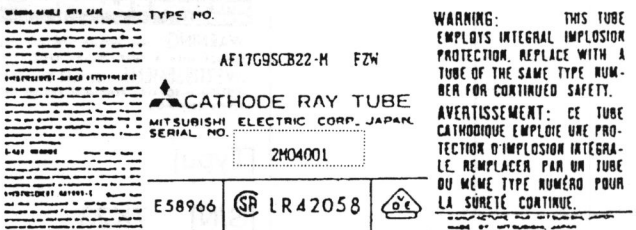
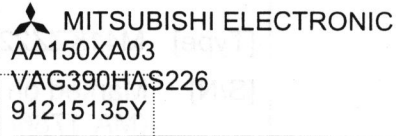
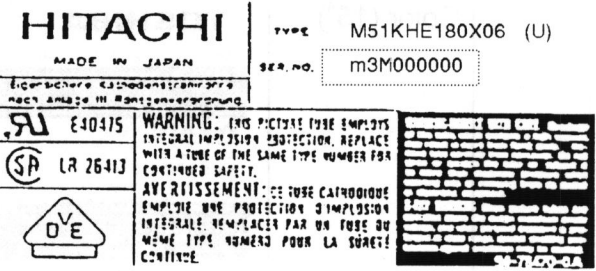
## 8. Packing

	Works	Controlled Item	Equipment																		
1	Cover new packing bag on the product.																				
2	Pack the enclosed accessories from the user.	Enclosed accessories																			
3	Confirm that product name and S/N on the Name-Plate is same in order not to mis-shipment.	Model Name, S/N																			
4	Equip the cushion (If it damaged badly, replace with new one.) (A) Fix the bottom of the cushion with plain dumpron tape (50mm width) (small model like F550-iW) (B) Fasten with P.P Band (Large model like T660I or T560I, etc.) (C) Confirm the direction and location when 4 separated cushion. Are equipped. (D) Others	Cushion																			
5	<p>Put the product in the packing case with noting its direction. (Packing case other than EIZO's or badly damaged one should be replaced with new one)</p>  <p>[How to put the dampron tape at packing]</p> <table border="1"> <thead> <tr> <th></th><th>Model</th><th>Tape (Width)</th><th>way</th></tr> </thead> <tbody> <tr> <td rowspan="2">Bottom</td><td>20" larger</td><td>00N08071A3 (50mm)</td><td>H</td></tr> <tr> <td>19" smaller, LCD, Peripheral</td><td>00N08071A5 (75mm)</td><td>I</td></tr> <tr> <td rowspan="2">Top</td><td>20" larger</td><td>00N08071A3 (50mm)</td><td>I</td></tr> <tr> <td>19" smaller, LCD, Peripheral</td><td>00N08071A5 (75mm)</td><td>I</td></tr> </tbody> </table>		Model	Tape (Width)	way	Bottom	20" larger	00N08071A3 (50mm)	H	19" smaller, LCD, Peripheral	00N08071A5 (75mm)	I	Top	20" larger	00N08071A3 (50mm)	I	19" smaller, LCD, Peripheral	00N08071A5 (75mm)	I	Dampron tape	
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	19" smaller, LCD, Peripheral	00N08071A5 (75mm)	I																		
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### III. Materials for Service


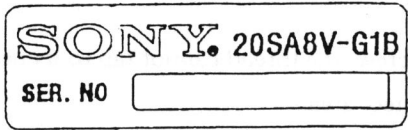
#### III-1 How to read the Serial Number of CRT and LCD Panel Type

Manufacturer	Type	Sample
MITSUBISHI	All Display Tubes & TV Tubes excluding A63LCC11X	 <p>[Type] AF17G9SCB22-M</p> <p>[S/N] <b>2M04001</b></p> <p>year 1992 Production</p> <p>month <b>M</b> = December</p> <p>(Staring from A~M excluding "I")</p>
	only for A63LCC11X	<p>03:17:10</p> <p>01-25-89</p> <p>[S/N] <b>03:17:10</b> time <b>3:17:10</b> (24Hr)</p> <p><b>01-25-89</b> date 1989. 1(January). 25</p>
	LCD Panel	 <p>[Type]</p> <p>[S/N] ____15135Y</p> <p>year <b>9</b> Production</p> <p>week <b>12</b></p>
HITACHI		 <p>[Type] M51KHE180X06</p> <p>[S/N] m____000000</p> <p>year <b>3</b> Production</p> <p><b>M</b> = December</p> <p>(Staring from A~M excluding "I")</p>



Manufacturer	Type	Sample
TOSHIBA	LCD Panel	<p>TOSHIBA MADE IN JAPAN LTM15C151A</p> <p>                 </p> <p>* 6 6 C 8 L 1 0 0 6 5 2 *</p> <p>[S/N] 66C<u>8</u>L100652  year 199<u>8</u> Production  month <u>L</u>=December (Starting from A~L)</p>
SHARP	LCD Panel	<p>SHARP LQ14X03 8X T00004 MADE IN JAPAN</p> <p>[Type] LQ14X03  [S/N] <u>8X</u> T00004  year 199<u>8</u> Production  month <u>X</u> = October (Starting from 1~9(Jan.~Sep.)  X(Oct.), Y(Nov.), Z(Dec.))</p>
IBM	LCD Panel (2 labels on the rear)	<p>OGJ800001</p> <p>P/N 25L779C IBM EC F21755 S/N 800001 ITSX94N1</p> <p>99/48</p> <p>[S/N] 800001  year 199<u>9</u> Production  week week <u>48</u> Production</p>
HITACHI	LCD Panel	<p>HITACHI TX46D12VCOCAB</p> <p>9033H 00001</p> <p>MADE IN JAPAN</p> <p>[S/N] <u>9033H 00001</u>  year 199<u>9</u> Production  month <u>03</u> = March (01~12 &lt;Jan.~Dec.&gt;)  week <u>3</u> = 15th ~21st. (1<sup>st</sup>~7<sup>th</sup>:1, 8<sup>th</sup>~14<sup>th</sup>: 2,  15<sup>th</sup>~21<sup>st</sup>:3. 22<sup>nd</sup>~28<sup>th</sup>: 4, 29<sup>th</sup>~31<sup>st</sup>: 5)  (00001) = conductive number</p>

Manufacturer	Type	Sample
MATSUSHITA (PANASONIC)	All	<div style="border: 1px solid black; padding: 10px; margin-bottom: 10px;"> <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p style="text-align: center;">Type</p> <p style="text-align: center;">Shipping No.</p> <p style="text-align: center;">Notes</p> </div> <div style="width: 35%; border-left: 1px solid black; padding-left: 5px;"> <p style="text-align: center;">Type</p> <p style="text-align: center;">Shipping No.</p> </div> </div> </div> <p>[S/N] Shipping No. <b>17</b>  year 1991 Production  month <b>7</b> = July (1~0 = Jan~Oct, N=Nov, D=Dec)</p>
NEC	All	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">COLOR DISPLAY TUBE</p> <p style="text-align: right;">M41LQI15XX44</p> <p><b>WARNING:</b> THE PICTURE TUBE EMPLOYING INTERNAL EXPLOSION PROTECTION. REPLACE WITH A TUBE OF THE SAME TYPE NUMBER FOR CONTINUED SAFETY.</p> <p><b>AVERTISSEMENT:</b> LE TUBE (POMMEUSE) EMPLOIE UNE PROTECTION D'EXPLOSION INTERIEURE. REPLACEZ PAR UN TUBE DU MEME TYPE NUMERO POUR LA SECURITE CONTINUE.</p> <p style="text-align: right;">(U?)</p> <p style="text-align: right;">610100001</p> <p style="text-align: right;"><b>WARNING:</b> HIGH-VOLTAGE PICTURE TUBE IS DANGEROUS TO HANDLE. REFER SERVICE TO QUALIFIED SERVICE PERSONNEL.</p> <p style="text-align: right;"><b>1-RAY WARNING:</b> When picture tube is operating at very high voltage, and when picture appears in package or clear stage, special shielding precautions against 2-ray radiation may be needed.</p> <p style="text-align: right;">NEC Corporation</p> <div style="display: flex; justify-content: space-around; align-items: center;">     </div> </div> <p>[Type] M41LQi15XX44  [S/N] <b>610 10001</b>  year 1996 Production  month <b>10</b> = October (1~12 = Jan.~Dec.)</p>

Manufacturer	Type	Sample
SONY	14FGES	[S/N] <b>2 0614</b> 12345 year 1992 Production date <b>0614</b> = June 14
	19TKC	 <div>             S/N  <b>039905035085 S</b>               Year 1999 Production              Date <b>0503</b> =May 3              S/N 5085S              (Consecutive number)           </div>
	17SA 20SA	 <div>             [Type] 20SA8V-G1B              [S/N] consecutive number           </div>

### III-2 Screw and nut torque List

1. The unit of the torque in the list----- kgf·cm
2. The torque value is common to mechanical screw and tap-tight screw.
3. The above list is applied when there is no poor tightening due to the imperfect area and thread is tightened over 2 with the tightened materials.
4. If the value is within the listed standard, the slip or damage to the screw may occur due to the screw or working condition.
5. Glossary (reference)

#### 1) Nominal Size of the Screw

The screw is divided by its size. The mechanical screw is like M2, M3, M4 and the tap tight screw is like 2, 3, 4. The number indicates the diagonal of the screw.

#### 2) Mechanical Screw

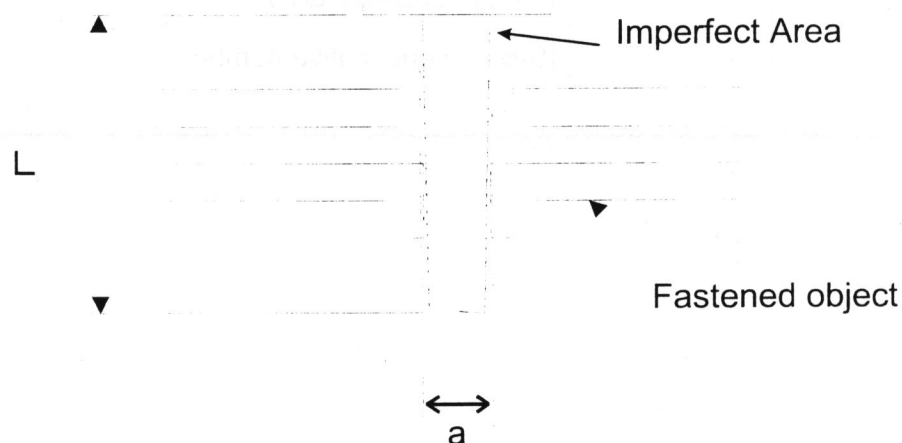
The thread is tapped to the fastened object in accordance to the pitch of the screw. This screw avoids the screw error and its torque value is easy to be controlled.

#### 3) Tap tight screw

Without tapping the fastening object, the screw itself taps the thread (self-tap screw). Then, the screw, which does not make tapping chip, is called tap-tight screw.

#### 4) Imperfect area

If thread the screw, the thread cannot tap to its head due to production reason. This area is called imperfect area.



# 1. General torque standard (factory standard)

tighted diameter material (incl. Nut)	Aluminum (Al)	Steel (SPCC,SECC)	Resin (ABS,PS,Plastic) (L=Length of Screw)	
Nominal Size 3	5.0~9.0	6.0~10.0	L<10mm 4.0~8.0	10mm<L 6.0~10.0
Size 4	8.0~12.0	9.0~15.0	L<12mm 8.0~12.0	12mm<L 9.0~15.0
Size 5	*	15.0~25.0	L<20mm *	20mm<L 15.0~25.0
Size 6	*	20.0~30.0	*	
Size 8	*	Fix the CRT Refer to list 2	*	
Main use	fix the discharge plate (t>1.6)	bracket base, etc. sheet metal	fixing PCB (Size 3) FBT (Size 3) F.P (Size 4) to the Base or F.P	



## 2. Special Torque (Extraction the torque value which is out of the factory standard.)

Location	Model	Torque(kgf.cm)
Fixing CRT	MA-1560/61/62	40~45
	MA-1563	30~35
	MA-1783	25~31
	MA-1767/82	40~45
	MA-1762/64/66/80	45~55
	17 & 19" after MA-1570, 1790	37~43
	MA-2090/2091/2191/21A2/2192	40~50
	MA-1786/1794	30~36
	MS-2930	55~75
CP MAGNET	MA-1783	20
	MA-2171/2190/21B1	14~15
ASSY U202	MA-1767/82/83	8~10
BACK-COVER	MA-1767/82/83	13~19
	17 & 19" after MA-1570, 1790	
PCB-SW	MA-1570	5~9
	All the model after MA-1790	6~10
Power Earth	MA-2190/21A1	12
	All the model after MA-1790	
Equipping AC-INLET	All the model after MA-1790	8
Fixing LCD Panel	FA-1340/1561/1562/1563	5.5~7.5
Fixing ASSY MAIN-UNIT and TILT-STAND	FA-1340	13~15
Equipping ASSY PCB SUB-S*1	FA-1340	2.5~3.5
Equipping ASSY STAND-UNIT to PLATE-S*2	FA-1561	15~17
Equipping ASSY STAND-UNIT to SWIEBEL*3	FA-1880	16~20
Fixing STAY and ASSY CHASSIS	MS-2930	12~16
Fixing Q302 and radiator	MS-2930	2~3
Fixing the CASE	DH-1401	4~8

\*1-3 Refer to the Disassembling drawing in the Service Manual for the detail.

\*1 the torque value of screw No.13 which fixing the item No.G

\*2 the torque value of screw No.p which fixes the item No.q

\*3 the torque value of screw No.f which fixes the item No.8.

# Section 1 – SPECIFICATION

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## CRT Specification

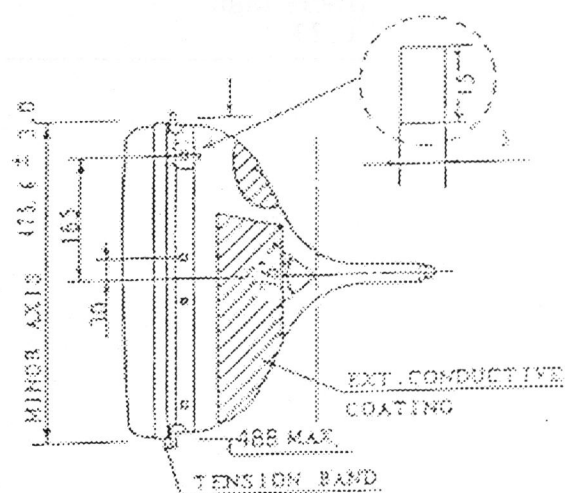
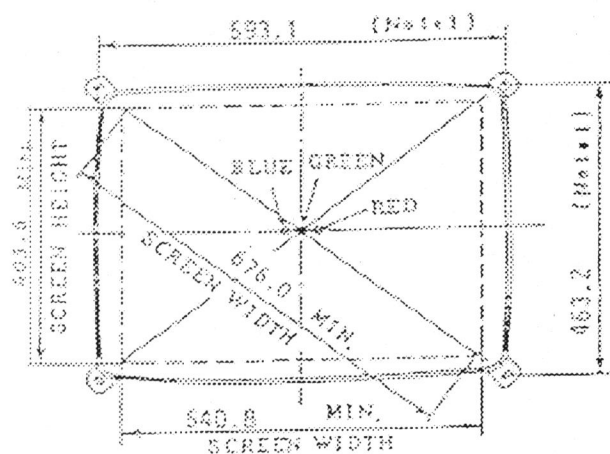
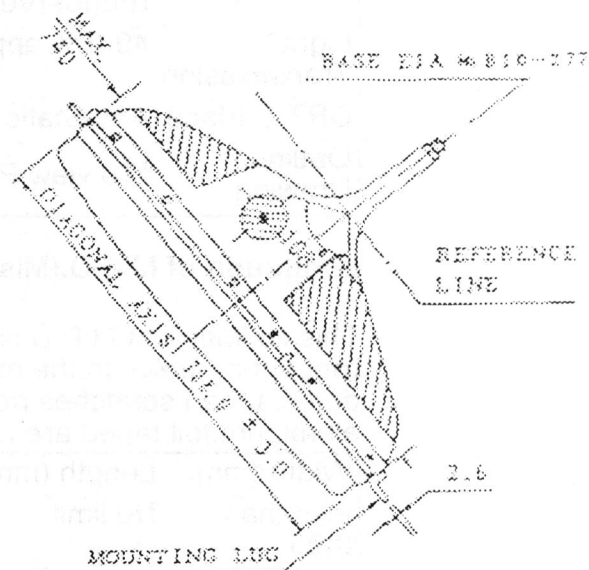
Type	A68KSM696X(B)
Size	29 inch 108° Deflection
Display Area	540mm×405mm
Trio Pitch	Horizontal: 0.79mm (Center), 0.97 mm (Edges)Vertical: 0.64 mm
Light Transmission	49.0 % approx.
CRT Surface	Anti-Static Coating
Outline Drawing	*To view PDF file

### Limitation of M.P.D.(Missing Phosphor Dots) for CRT

This limitation of M.P.D is applied to the effective screen (phosphor area). In the other screen area, limited are no other defects than scratches preventing the anti-static effective in aluminum foil taped area.

Width (mm)	Length (mm)	Depth
less than 0.05	No limit	The nail is not caught
0.06~0.13	50mm MAX.	
0.14~0.20	19mm MAX.	
more than 0.21	-	

Unit: mm



1-2

## ELECTRICAL SPECIFICATIONS

**Standard condition**

**Display**

**Distortion**

**ITC Performance**

**Power Supply**

**Signal Input**

**Recommended Signal Timing Chart**

**Adjustment Specifications**

## ELECTRICAL SPECIFICATIONS

All measurements are subject to the conditions below, unless otherwise specified.

Input signal	Recommended Signal Timing
Brightness	33% window pattern : 60 ft-L, white field pattern : 32 ft-L
Magnetic field	BH: 30 $\mu$ T, BV: 35 $\mu$ T (Japanese magnetic field)
Measurement	After warm up for at least 30 minutes
Display area size	540mm $\times$ 405mm
Ambient temperature	20 C°~30 C°
Setting conditions	MS-2934-S/SW (TV Style) *The screen faces the east and the adjustment volumes and switches are in default settings, unless otherwise specified. MS-2934-SF/SFW/SN/SNW (Face Top) *The screen faces the top and the anode button of CRT faces west. Adjustment volumes and switches are in default settings, unless otherwise specified.

## ELECTRICAL SPECIFICATIONS

**Standard condition**

**Display**

**Distortion**

**ITC Performance**

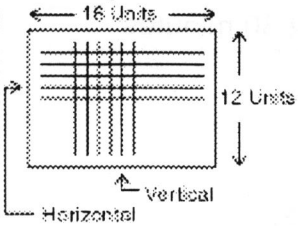
**Power Supply**

**Signal Input**

**Recommended Signal Timing Chart**

**Adjustment Specifications**

### Display

Items	Values	Condition
Scanning Frequency	Horizontal: 31.5 kHz $\pm$ 500Hz Vertical: 55 ~ 65 Hz	
Retrace Time	Horizontal: 6.0 $\mu$ s max. Vertical: 1.1 ms max.	
Linearity 	Horizontal: $\pm$ 10 % max. Vertical: $\pm$ 8 % max.	To be measured with Cross-hatch patternAs obtained through following formula. $H = \{(X \text{ max. or } X \text{ min.}) - (X \text{ Ave.})\} / (X \text{ Ave.}) \times 100$ $V = \{(Y \text{ max. or } Y \text{ min.}) - (Y \text{ Ave.})\} / (Y \text{ Ave.}) \times 100$
Center Resolution	640 $\times$ 633 dots	As obtained through following formula.Center Resolution = Display area size / Center phosphor pitch
Video Bandwidth	Over 18MHz	The standard video output is 100kHz, 40Vp-p. The frequency is -3dB.



## ELECTRICAL SPECIFICATIONS

Standard condition

Display

Distortion

ITC Performance

Power Supply

Signal Input

Recommended Signal Timing Chart

Adjustment Specifications

### Distortion

Item	Values	Conditions
Trapezoidal	3.0 % max	To be measured based on JIS- C6101 and the CRT faces east
Barrel/Pincushion		
Tilt	2° max	

## ELECTRICAL SPECIFICATIONS

### Standard condition

### Display

### Distortion

### ITC Performance

### Power Supply

### Signal Input

### Recommended Signal Timing Chart

### Adjustment Specifications

#### ITC Performance

Item	Value	Conditions
Jitters	To be invisible from the distance of 50 cm from CRT surface.	-
Color Purity	Conspicuous different colors shall not be recognizable with Red-field pattern against all directions after the internal degaussing.	To be degaussed in each direction.
Convergence	*Within a circle whose diameter is equivalent to 60 % of V. length of CRT: 1.5 mm max. *Within a circle whose diameter is equivalent to vertical length of CRT (excluding the above circle): 2.5 mm max. *Within CRT screen (excluding the above circles) : 3.0 mm max.	Max. deviation among RGB raster line center distances, either horizontal or vertical, shall not exceed the left listed value
White Balance	x: 0.285±0.02 y: 0.285±0.02 Color Temperature 9700K approx.	To be measured at center of a white-window pattern with Bright VR and Contrast VR in adjusted settings.
Focus	To be adjusted best.	-
Maximum brightness	60±10ft-L	Input signal 0.7 Vp-p To be measured with a white field pattern.

## ELECTRICAL SPECIFICATIONS

**Standard condition**

**Display**

**Distortion**

**ITC Performance**

**Power Supply**

**Signal Input**

**Recommended Signal Timing Chart**

**Adjustment Specifications**

### Power Supply

Item	Value	Conditions
Input current and voltage	100~120VAC $\pm$ 10%, - 50/60Hz, 2A max.	
In-rush current	72 A peak max	At 132 VAC
Power Consumption	110 $\pm$ 16W	To be measured in default settings with a white field pattern.
Leakage current	1.0mA max 3.5mA max	at 100V, 60Hz at 120V, 60Hz

## ELECTRICAL SPECIFICATIONS

Standard condition

Display

Distortion

ITC Performance

Power Supply

Signal Input

Recommended Signal Timing Chart

Adjustment Specifications

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### Signal Input

Sync Input Signal Form	H/V Composite, Negative or H/V Separate Sync, Positive/Negative
Video Input Signal Form	analogue, Positive
Scanning	Non-Interlace

## ELECTRICAL SPECIFICATIONS

**Standard condition**

**Display**

**Distortion**

**ITC Performance**

**Power Supply**

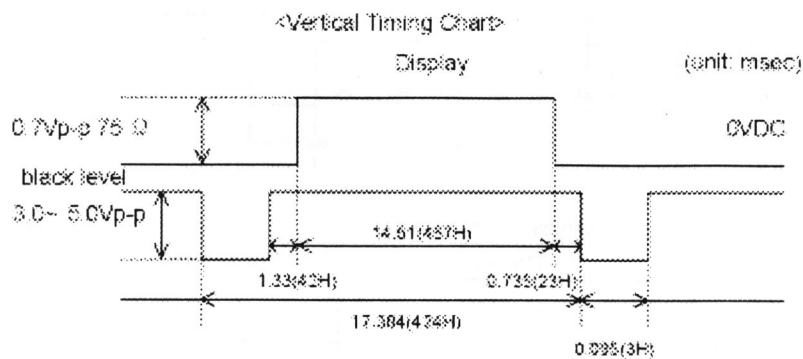
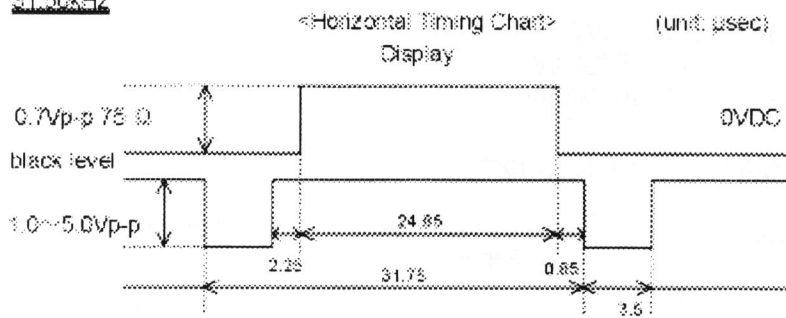
**Signal Input**

**Recommended Signal Timing Chart**

**Adjustment Specifications**

### Recommended Signal Timing Chart

31.50kHz



# ELECTRICAL SPECIFICATIONS

Standard condition

Display

Distortion

ITC Performance

Power Supply

Signal Input

Recommended Signal Timing Chart

Adjustment Specifications

## Adjustment Specifications

MS-2934-S/SW

MS-2934-SF/SFW

MS-2934-SN/SNW

### \* NAOMI(31k) Timing Chart

